

IN THE CLAIMS

Please amend the claims as shown below, in which deletions are indicated by strikethrough and/or by double brackets, and additions are indicated by underscoring. Please add new claim 37. The current listing of claims will replace all prior versions, and listings, of claims in the application.

Claims 1-15 (canceled)

Claim 16 (Currently Amended). A position detection apparatus for detecting a position of a moving robot, said position detection apparatus comprising:

a local image acquisition device for acquiring an image of a forward field of view of said moving robot;

a distance image acquisition device, having the same field of view as said local image acquisition device, said distance image acquisition device operable to acquire a distance image simultaneous to acquisition of an image by said local image acquisition device;

a characteristic point extraction device that extracts respective characteristic points from the images by a specific method, wherein the characteristic points are created using two consecutively incorporated images, and

a reference characteristic point selection device that selects a reference characteristic point for calculating the position of the moving robot, based on the characteristic points and the distance image.

Claim 17 (Previously presented). A position detection apparatus according to claim 16, wherein the characteristic point extraction device extracts respective characteristic points from the images of at least two consecutive frames, and

wherein the reference characteristic point selection device calculates the amount of displacement of a position between two frames of a characteristic point extracted by said characteristic point extraction device based on said distance image, and selects a reference characteristic point for calculating position according to said amount of displacement.

Claim 18 (Previously presented). A position detection apparatus according to claim 16, wherein

the characteristic point extraction device includes a position detection device that detects position by substituting self-movement control and the observed amount of said reference point into an extended Kalman filter, and

the reference characteristic point selection device includes a reference point determination device that determines a reference characteristic point to serve as a reference during movement of said moving robot based on an image obtained from said local image acquisition device.

Claim 19 (Previously presented). A position detection apparatus according to claim 16, wherein the reference characteristic point selection device compares pre-stored object information with extracted characteristic points, and considers those characteristic points having a high correlation to be known characteristic points that are used as reference characteristic points for calculating position.

Claim 20 (Previously presented). The position detection apparatus according to claim 19, wherein said reference characteristic point selection device updates said object information by determining the relative relationship between unknown characteristic points and known

characteristic points in an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

Claim 21 (Previously presented). The position detection apparatus according to claim 16, wherein said characteristic point extraction device comprises:

a characteristic point group extraction device that extracts a characteristic point group in said image, and

a position detection device that calculates position by correlating and storing multiple characteristic point groups in an image pre-obtained with said image acquisition device with positions at which said characteristic point groups are obtained, and calculating the correlation between a characteristic point group of a newly obtained image and pre-stored characteristic point groups.

Claim 22 (Currently Amended). A position detection method for detecting a position of a moving robot, said position detection method comprising:

a local image acquisition step of acquiring an image of a forward field of view of said moving robot;

a distance image acquisition step that, in the same field of view as said local image acquisition step, acquires a distance image simultaneous to acquisition of an image by said local image acquisition step;

a characteristic point extraction step that extracts respective characteristic points from the images by a specific method, wherein the characteristic points are created using two consecutively incorporated brightness images, and

a reference characteristic point selection step that selects a reference characteristic point

for calculating the position of the moving robot, based on the characteristic points and the distance image.

Claim 23 (Previously presented). The position detection method according to claim 22, wherein the characteristic point extraction step extracts respective characteristic points from the images of at least two consecutive frames, and

wherein the reference characteristic point selection step calculates the amount of displacement of a position between two frames of a characteristic point extracted by said characteristic point extraction step based on said distance image, and selects a reference characteristic point for calculating position according to said amount of displacement.

Claim 24 (Previously presented). The position detection method according to claim 22, wherein the characteristic point extraction step comprises a position detection step that detects position by substituting self-movement control and the observed amount of said reference point into an extended Kalman filter, and

the reference characteristic point selection step comprises a reference point determination step that determines a reference characteristic point to serve as a reference during movement of said moving robot based on an image obtained from said local image acquisition step.

Claim 25 (Previously presented). The position detection method according to claim 22, wherein the reference characteristic point selection step compares pre-stored object information with extracted characteristic points, and considers those characteristic points having a high correlation to be known characteristic points that are used as reference characteristic points for calculating position.

Claim 26 (Previously presented). The position detection method according to claim 25, wherein said reference characteristic point selection step updates said object information by determining the relative relationship between unknown characteristic points and known characteristic points in an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

Claim 27 (Previously presented). The position detection method according to claim 22, wherein said characteristic point extraction step comprises:

- a characteristic point group extraction step that extracts a characteristic point group in said image, and

- a position detection step that calculates position by correlating and storing multiple characteristic point groups in an image pre-obtained with said image acquisition step with positions at which said characteristic point groups are obtained, and calculating the correlation between a characteristic point group of a newly obtained image and pre-stored characteristic point groups.

Claim 28 (Currently Amended). A position detection program for detecting position of a moving robot, said position detection program comprising performing by computer:

- a local image acquisition processing of acquiring an image of a forward field of view of said robot;

- a distance image acquisition processing that, in the same field of view as said local image acquisition processing, acquires a distance image simultaneous to acquisition of an image by said local image acquisition processing;

- a characteristic point extraction processing that extracts respective characteristic points

from the images by a specific program, wherein the characteristic points are created using two consecutively incorporated brightness images, and

a reference characteristic point selection processing that selects a reference characteristic point for calculating the position of the moving robot, based on the characteristic points and the distance image.

Claim 29 (Previously presented). The position detection program according to claim 28, wherein the characteristic point extraction processing extracts respective characteristic points from images of at least two consecutive frames, and

wherein the reference characteristic point selection processing calculates the amount of displacement of a position between two frames of a characteristic point extracted by said characteristic point extraction processing based on said distance image, and selects a reference characteristic point for calculating position according to said amount of displacement.

Claim 30 (Previously presented). The position detection program according to claim 28, wherein the characteristic point extraction processing comprises a position detection processing that detects position by substituting self-movement control and the observed amount of said reference point into an extended Kalman filter, and

the reference characteristic point selection processing comprises a reference point determination processing that determines a reference characteristic point to serve as a reference during movement of said moving robot based on an image obtained from said local image acquisition processing.

Claim 31 (Previously presented). The position detection program according to claim 28,

wherein the reference characteristic point selection processing updates said object information by determining the relative relationship between unknown characteristic points and known characteristic points in an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

Claim 32 (Previously presented). The position detection program according to claim 31, wherein said reference characteristic point selection processing updates said object information by determining the relative relationship between unknown characteristic points and known characteristic points in an image in which characteristic points considered to be known are present, and storing said unknown characteristic points as known characteristic points.

Claim 33 (Previously presented). The position detection program according to claim 28, wherein said characteristic point extraction processing comprises:

a characteristic point group extraction processing that extracts a characteristic point group in said image, and

a position detection processing that calculates position by correlating and storing multiple characteristic point groups in an image pre-obtained with said image acquisition processing with positions at which said characteristic point groups are obtained, and calculating the correlation between a characteristic point group of a newly obtained image and pre-stored characteristic point groups.

Claim 34 (Currently Amended). The position detection apparatus of claim 16, wherein said position detection apparatus further comprises two cameras, and wherein

the image acquired by the local image acquisition device comprises a brightness image in

which pixels in the image acquired by the local image acquisition device represent relative brightness, and

the distance image acquired by the distance imaging device is formed by determining corresponding points of the pixels of each image from [[the]] two brightness images obtained with the cameras such that pixels in the distance image represent a distance from the cameras.

Claim 35 (Currently Amended). The position detection method according to claim 22, wherein said position detection apparatus further comprises two cameras, and wherein

the image acquired by the local image acquisition device comprises a brightness image in which pixels in the image acquired by the local image acquisition device represent relative brightness, and

the distance image acquired by the distance imaging device is formed by determining corresponding points of the pixels of each image from [[the]] two brightness images obtained with the cameras such that pixels in the distance image represent a distance from the cameras.

Claim 36 (Currently Amended). The position detection program according to claim 28, wherein said position detection apparatus further comprises two cameras, and wherein

the image acquired by the local image acquisition device comprises a brightness image in which pixels in the image acquired by the local image acquisition device represent relative brightness, and

the distance image acquired by the distance imaging device is formed by determining corresponding points of the pixels of each image from [[the]] two brightness images obtained with the cameras such that pixels in the distance image represent a distance from the cameras.

Claim 37 (New). A position detection apparatus for detecting a position of a moving robot, said position detection apparatus comprising:

- a local image acquisition device for acquiring an image of a forward field of view of said moving robot;

- a distance image acquisition device, having the same field of view as said local image acquisition device, said distance image acquisition device operable to acquire a distance image simultaneous to acquisition of an image by said local image acquisition device;

- a characteristic point extraction device that extracts respective characteristic points from the images by a specific method, wherein the characteristic point extraction device extracts respective characteristic points from the images of at least two consecutive frames, and

- a reference characteristic point selection device that selects a reference characteristic point for calculating the position of the moving robot, based on the characteristic points and the distance image,

wherein the reference characteristic point selection device calculates the amount of displacement of a position between two frames of a characteristic point extracted by said characteristic point extraction device based on said distance image, and selects a reference characteristic point for calculating position according to said amount of displacement.